



Idaho State Department of Agriculture
Division of Agricultural Resources



Payette Ditch Water Quality Monitoring Report
prepared for
Weiser River Soil Conservation District
April 2010 through September 2010

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ISDA Technical Report Summary W-37

October 2010

Introduction

At the request of the Weiser River Soil Conservation District (WRSCD) the Idaho State Department of Agriculture (ISDA) conducted a water quality monitoring project on the Payette Ditch (PD). The Payette Ditch is an irrigation conveyance ditch that originates at the Payette River diversion and flows northerly approximately 20 miles prior to discharging into the Weiser River just east of Weiser, Idaho (Figure 1). The Payette Ditch has diversions and spillways that divert water for irrigation. The ditch also receives irrigation return water along its entire length.

The monitoring was conducted at the outlet of the Payette Ditch (PD-1) prior to discharge into the Weiser

River (Figure 1). The 2010 monitoring data will be used as background data prior to the installation of a proposed 319 funded wetland. The proposed wetland will treat Payette Ditch water prior to its discharge into the Weiser River by reducing phosphorus and sediment loads into the Weiser River. This 2010 data will allow the Weiser District to calculate overall load reductions, for sediment and phosphorus, once the wetland is operational.

ISDA monitored twice a month from April 28, 2010 through September 28, 2010 ($n = 11$). Samples were collected and analyzed for suspended sediment concentration (SSC) and total phosphorus (TP). On-site measurements for discharge in cubic feet per second (CFS) were collected during each sampling event.

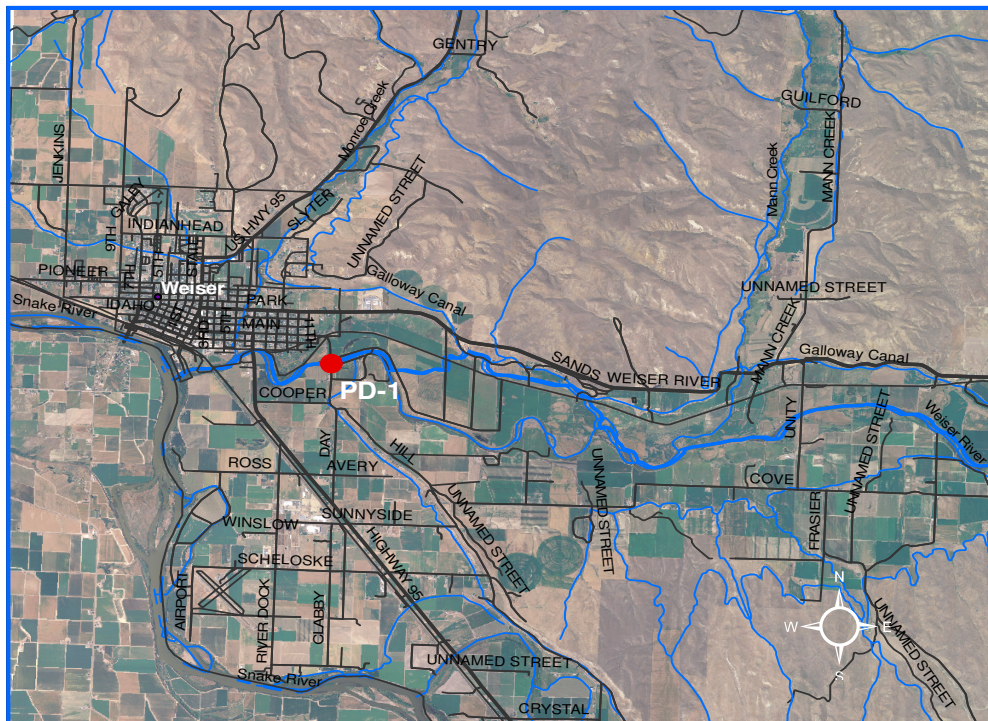


Figure 1. Payette Ditch monitoring location.

ISDA had previously conducted monitoring on the Payette Ditch in 2003 for the Payette Ditch Company (Water District 65), and the Weiser River Watershed Advisory Group (WAG). Comparison of the 2003 data with the 2010 data can be made for both phosphorus and discharge. Reliable sediment comparisons cannot be achieved due to the differences in analytical techniques for total suspended solids (TSS in 2003) and suspended sediment concentration (SSC in 2010). According to Glysson et.al (2000), there is no simple straightforward way to adjust TSS data to estimate SSC if paired samples are not available.

General Results

Discharge

At PD-1 the average discharge rate at the outlet was nearly identical when comparing 2003 (16.6 CFS) and 2010 (16.3 CFS) discharge data. The hydrograph (Figure 2) shows variation in the high and low flows of the 2003 and 2010 instantaneous measurements; but the overall average for both years is very consistent.

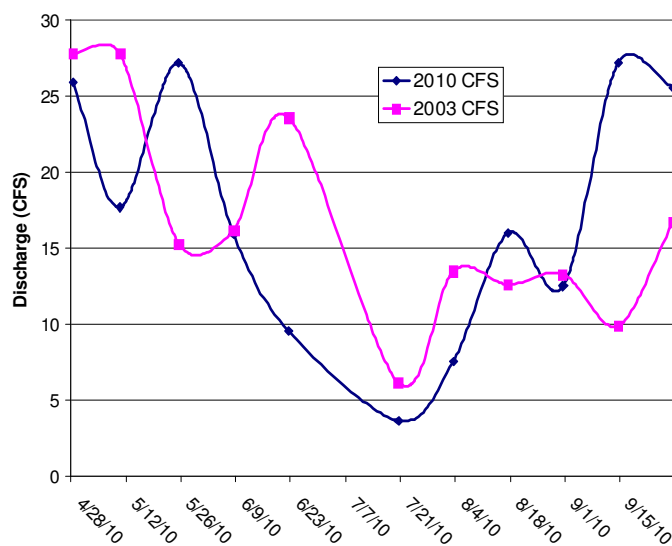


Figure 2. Payette Ditch discharge for 2003 and 2010.

Suspended Sediment Concentration (SSC)

The two highest SSC concentrations of 187 mg/L and 146 mg/L occurred on May 10, 2010 and September 14, 2010 respectively (Figure 3). The highest concentrations also translated into the two largest loads of 17, 722 lbs/day and 21,286 lbs/day respectively. Loads are calculated by multiplying the concentration (mg/L) by the discharge (CFS) and a constant 5.36. The average SSC load being discharged from the Payette Ditch into the Weiser River is 7, 548 lbs/day.

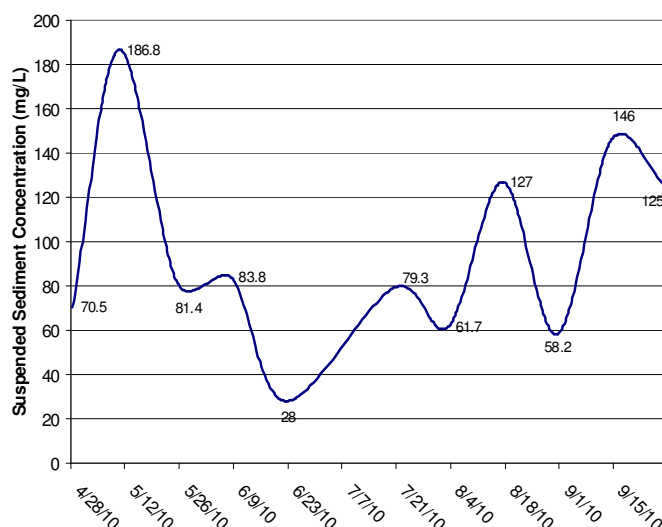


Figure 3. Payette Ditch SSC concentrations.

Total Phosphorus (TP)

The dominate form of phosphorus in the Payette Ditch is in the particulate form (ISDA, 2003). Statistically comparing total phosphorus concentrations from ISDA's 2003 data and 2010 data, indicates that there was a significant difference in concentrations between the two studies ($P = 0.009$). The box plot in Figure 4 visually illustrates the differences in the 2003 and 2010 data sets.

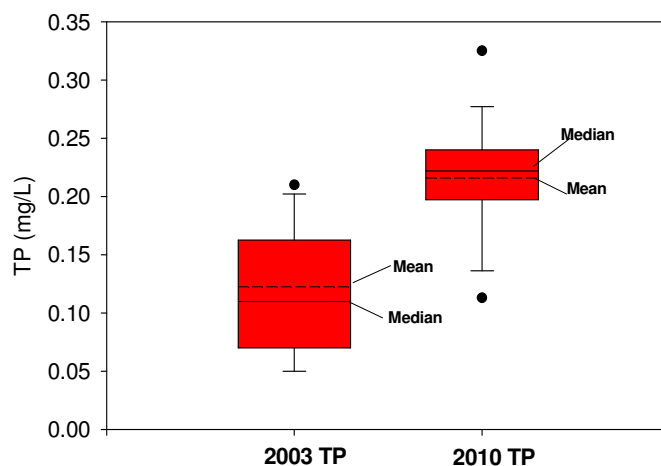


Figure 4. Total Phosphorus concentrations (mg/L).

The mean concentration of TP was 0.21 mg/L for the 2010 study and 0.13 mg/L for data collected in 2003. Average loading of TP into the Weiser River was 12 lbs/in 2003 and 18 lbs/day in 2010. Figure 5 illustrates the higher individual phosphorus concentrations when comparing 2003 data to 2010 data.

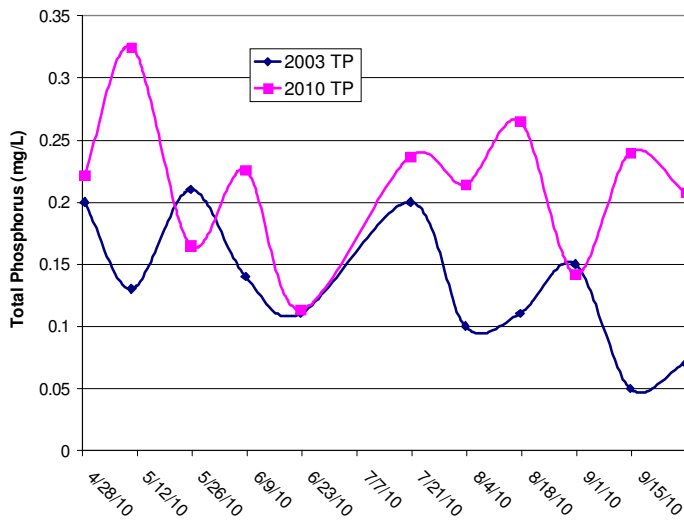


Figure 5. Total phosphorus concentrations.

Conclusion

The sediment Total Maximum Daily Load (TMDL) for the Lower Weiser River is based on two separate criteria; 1) less than or equal to 50 mg/L TSS for no greater than 30 days and 2) less than or equal to 80 mg/L for not more than 14 days. Both criteria are calculated based on a geomean of the data over the exposure duration. The 2010 data for SSC indicates the Payette Ditch exceeds both criteria (not based on geomean data) at times and contributes excess sediment into the Weiser River (Attachment A).

In order for the Weiser River to achieve the overall concentration goal of 0.07 mg/L phosphorus to meet the Snake River Hells Canyon Complex (SR-HC) TMDL the Weiser River would need to reduce its phosphorus load by approximately 62%.

The Payette Ditch contributes on average 0.21 mg/L of phosphorus to the Lower Weiser River and would require a 67% reduction to meet the 0.07 mg/L phosphorus goal.

A properly structured wetland that can deliver 60 to 65% reduction efficiency for both sediment and phosphorus would allow the Payette Ditch water to meet the goals established for the Lower Weiser River and SR-HC TMDL.

References

Idaho State Department of Agriculture, 2004. Payette Ditch Water Quality Monitoring Report.

Glysson, G.D., Fray, J.R., and Conge, L.M., 2000, Adjustment of total suspended solids data for use in sediment studies: Proceedings, ASCE's 2000 Joint Conference on Water Resources Engineering and Water Resources Planning and Management, July 31-August 2, 2000, Minneapolis, Minn., 10p.

Gray, J.R., Glysson, G.D., Torcios, L.M., and Schwarz, G.E., 2000, Comparability of Suspended-Sediment Concentration and Total Suspended Solids Data, Water-Resources Investigation Report, U. S. Geological Survey Water Resources, Investigation Report 00-4191, 12p.

Attachment A
Payette Ditch
Raw Data

Date	SSC	TP	CFS
4/28/2010	70.5	0.222	25.9
5/10/2010	186.8	0.325	17.7
5/25/2010	81.4	0.165	27.2
6/8/2010	83.8	0.226	15.9
6/22/2010	28	0.113	9.57
7/20/2010	79.3	0.237	3.65
8/3/2010	61.7	0.214	7.55
8/17/2010	127	0.265	16.0
8/31/2010	58.2	0.142	12.5
9/14/2010	146	0.24	27.2
9/28/2010	125	0.208	25.6